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ABSTRACT

This document describes some of the variables influencing the education of science teachers in Japan. One consideration involving the preservice education of science teachers relates to the type of undergraduate program. Both the Teacher Training System (TTS), in which the undergraduate students are based within the college of education, and the Non-Teacher Training system (Non-TTS), where undergraduates are based in a science or agriculture department and then obtain the necessary education credits for certification, are described. The fundamental qualifications and minimum number of credits for both service and education are listed for high school and junior high school science teachers, as well as for elementary school teachers. The in-service education of science teachers in Japan is also addressed. Three types of in-service training include: (1) inservice education taken at a science education center; (2) taking courses at a university; and (3) voluntary attendance at meetings of science teaching associations. (TW)

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THE PRESENT STATUS AND PROBLEMS OF PRE- AND IN-SERVICE TRAINING OF SCIENCE TEACHERS IN JAPAN

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The Present Status and Problems of Pre- and In-Service Training of Science Teachers in Japan

I. Pre-Service Training of Science Teachers in Japan at the Undergraduate Level

There are two kinds of Pre-Service Training Programs for Science Teachers in the Japanese educational system. One is within the department of education or the college of education which specially aims to train teachers. (These were called Normal Schools before the Second World War.) When the students graduate they obtain either the certificate of elementary or secondary school teachers. We call this system the Teacher Training System (T.T.S.).

The other type is within the other departments of the university which do not actually aim to train teachers. The department of science or department of agriculture are the examples. When the students from these departments graduate with the necessary credit for certification, they obtain the certificate of secondary science teachers. This is called the Non-Teacher Training System (Non-T.T.S.).

1. Pre-Service Training at the T.T.S. There are two types of teaching certificates: first class and second class. The fundamental qualification and minimum number of credits required in the university or college level are listd in Table 1.

Table 1. Fundamental qualifications and minimum number of credits

Kinds of Certificate		Fundamental Qualification	Minimum number of credits: Teaching Subject	Minimum number of credits: Educational Profession
Upper secondary school teacher	1st class	Master's degree	62	14
	2nd class	Bachelor's degree	40	
Lower secondary school teacher	1st class	Bachelor's degree	40	14
	2nd class	enrolled 2 yrs. or more in college	20	10
Elementary school teacher	1st class	Bachelor's degree	16	32
	2nd class	enrolled 2 yrs. or more in college	8	22

The second class certificate can be obtained by studying in a junior college for two years. This case is disregarded. For the first class elementary school teacher certificate the number of required credits of subjects covers 16 or more in natural science or social science. Each subject is equivalent to two credits. In

addition, 32 credits or more in professional education are necessary. The minimum number of credits and subjects required in professional education are listed in Table 2. The minimum number of subjects and credits as shown in Table 2 are the following:

(1) Principles of Education 4 credits

(2) Educational Psychology/Child Psychology 4 credits

(3) Research on Teaching Materials 16 credits

[This requires eight elementary school subjects or more with the subject - Research on Science Teaching Material - which has 2 credits]

(4) Research on Moral Education 2 credits

(5) Teaching Practice 4 credits

(6) Professional Education Subjects 2 credits

[Subjects offered are Educational Philosophy, Educational Administration and Educational System]

Other Disciplines of Professional Education Subjects 2 credits

Table 2. Required Subjects and Credits for Certification in Science

Kinds of Certificate	Subject	Minimum number of credits required	
Lower secondary school teacher	Physics (including Experiments)	5	
	Chemistry (including Experiments)	5	total
	Biology (including Experiments)	5	20
	Earth Science (including Experiments)	5	
Upper secondary school teacher	Physics	4	
	Chemistry	4	total
	Biology	4	20
	Earth Science	4	
	Experiments	4	

For the lower secondary science teacher certificate, the number of required credits for natural science subjects such as Physics and Chemistry is 40 credits or more. Half of the number of required credits on natural science subjects should be obtained following the prescribed subjects and credits as shown in Table 3. Physics, Chemistry, Biology, and Earth Science including "Experiments." Subjects equivalent to five credits for each subject. The rest of the 40 credits (20 credits) are selected disciplines for major fields such as Physics or Chemistry, etc.

Table 3. Minimum Number of Credits to be acquired Concerning Educational Profession

	Upper Secondary School Teacher		Lower Secondary School Teacher		Elementary School Teacher	
	1st	2nd	1st	2nd	1st	2nd
Principle of Education	3	3	3	2	4	2
Educational Psychology Child Psychology					4	2
Educational Psychology Adolescent Psychology	3	3	3	2		
Research on Teaching Material					16	12
Methodology of Science Teaching	3	3	3	2		
Research on Moral Education			2	1	?	1
Teaching Practice	2	2	2	2	4	4
other Educational Professions	3	3	1	1	2	1
Total	14	14	14	10	32	22

On the other hand, the minimum number of credits required in professional education is 14 or more as shown in Table 2.

(1) Principles of Education 3 credits

(2) Educational Psychology/Adolescent Psychology 3 credits

(3) Introduction to Science Education 3 credits

(4) Research on Moral Education 2 credits

Other disciplines of Professional Education or increased credits on any of the above subjects 1 credit

If we compare the requirements for the certificate of elementary school teachers to that of the lower secondary science teachers, we will find two points of difference. One difference is the number of credits between the teaching subject (disciplines of natural science) and the Professional Education (disciplines of education and psychology). In other words, for the elementary school teacher certificate, the number of required credits of Professional Education is more than the lower secondary science teacher certificate. However, for the lower secondary science teacher certificate, the number of required credits of natural science subjects is more than elementary school teacher certificate. Why? The reason is because in the lower and upper secondary school in Japan, each teacher teaches one subject (Science) in general. Thus, they need more science subjects for professional efficiency.

The other point can be derived from the same reason stated above. The "Introduction to Science Education" is required for the certificate of secondary school teacher in place of "Research on Teaching Material."

2. Pre-Service Training at Non-T.T.S.

When students graduate from Non-T.T.S. they obtain the first class certificate of lower science teacher and second class certificate upper secondary science teacher. Both have the same minimum number of credits of Teaching Subject and Professional Educational. However, we will find one point of difference as shown in Table 3. For the lower secondary science teacher, the required subjects are natural science fields with experiments. For example: Physics with experiments, Chemistry with experiments, Biology with experiments, and Earth

Science with experiments. Each of these subjects has five credits. The total number of credits is 20.

On the other hand, for the upper secondary science teacher, there are five required subjects with four credits each. The four natural science fields are Physics, Chemistry, Biology, and Earth Science, with all four courses being purely lectures. The fifth subject consists of experiments in the four natural science fields: Physics, Chemistry, Biology, and Earth Science. The total number of credits is also 20.

3. The Problems of Pre-Service Training of Science Teachers

(1) The Case with the Elementary School Teachers concerning natural sciences, the subjects required are "Introduction to Science" with two credits and "Research and Teaching Materials in Elementary Science" with two credits also. Most of the students tend to have only four credits for science subjects as above mentioned when they graduate at T.T.S.

Therefore, most elementary school teachers have insufficient skills and knowledge in science. Only a few teachers major in science at T.T.S. Therefore, they are the only ones who are skillful in elementary science. Elementary school teachers in Japan must teach basically all subjects at school. This causes a problem. Almost all elementary school teachers do not always perform well in science teaching, especially with the inquiry approach to teaching. Therefore, they tend to teach rote memory or knowledge-oriented science.

(2) The Case at The Upper Secondary Science Teachers

As shown in Table 2, most of the required subjects and credits for the upper secondary science teacher certificate are in the natural sciences, but there are not sufficient credits acquired concerning Professional Education with only 14 credits.

For that reason science teachers at upper secondary schools do not have enough knowledge of education and psychology. Most adolescents, 94 percent of whom are of the same age, go to upper secondary school. Varied abilities and personalities are shown by these students in the classes.

Therefore, the upper secondary science teachers which have mainly knowledge and skill of science, do not always effectively teach these variety of students.

II. In-Service Training of Science Teachers

There are three main kinds of In-Service Training of Science Teachers in Japan. One is the Science Education Center or Education Center in each prefecture. The second is in the university, especially, the undergraduate and graduate master course. The third is voluntary attendance at some science teaching associations.

1. In-Service Training in Science Education Center

The main activities of the Science Education Center are in-service training for science teachers. Training sessions lasting several days are held throughout the year, especially, during summer vacation. These training sessions are held for elementary school teachers, and lower and upper secondary school science teachers. Several staff members for the Science Education Center are selected from science teachers with many years of experience. They are mainly supervisors. The sessions have some lectures and some experiments.

Participants who are permitted by educational office of the respective prefecture or school principal get new information about science, the curriculum of school science manipulation of new science instruments, etc. They perform some experiments with the staff members and scientists or science educators from the university. Moreover, some science teachers who are given permission by local educational offices go to the Science Education Center. They carry out long-term research concerning science education. This period is three months to one year.

The expense of the training sessions is shared by the National Government and the respective local government. Tuition is free for all participants.

2. In-Service Training at the Undergraduate Level

Science teachers which have approximately ten years or more teaching experience at elementary and secondary school go to department of education or college of education. A few of upper secondary school science teachers go to the department of science at the university. They are selected and are given permission by the educational office of the respective prefecture. They are admitted by the university. The number of these teachers from the respective prefecture are not more then ten. The training period is either three months, six months, or one year. They receive their normal salary or more. Their local government employs substitute science teachers in the meantime. The science teachers which go to universities attend lectures, seminars, and do experiments in science education. The long-term research by teachers is performed with a professor of science education. When the teachers come back to school, they present a research report to the office of education in their prefecture. The tutition is free for these teachers.

3. In-Service Training of Teachers at Graduate Master Course

A few years ago, the Monbusho (Ministry of Education, Science and Culture) established three colleges which include in their graduate master course in-service training for compulsory school teachers a science subject. Also, eight departments of education and four teacher training colleges were established with graduate master courses which emphasize in-service training and more effective pre-service training.

In addition, eight years ago master courses which were mainly aimed at in-service training and more effective pre-service training of upper secondary school teachers with science subjects was established at the University of Tsukuba. This course gives the students a first class qualification as a science teacher when they graduate.

Each of these above courses, which is completed in two years, confer the master degree. Science teachers who go to these courses are selected and are given permission by the Office of Education in the respective prefecture. They are supported and funded by the Monbusho and local governments. They receive their ordinary salary or more. Their local government employs substitute science teachers for these two years. The tuition is free for all these teachers.

4. The Problems of In-Service Training of Science Teachers

Concerning the Monbusho funding, the three colleges mentioned earlier get higher priority for science teachers who work in compulsory school. The other colleges and departments of education are also funded by the Monbusho but with lower priority. As a result, the number of science teacher trainees in other colleges or departments of education are fewer.

Apparently, the problem is a financial one. As one teacher gets into the training course, the national and local government spends about three million or more yen for this teacher's salary for two years. It is difficult for the budget of the Monbusho and the local government to obtain sufficient money for the many trainees.

Therefore, teacher training courses at the graduate level in colleges other than the three colleges earlier mentioned have fewer of these science teachers.